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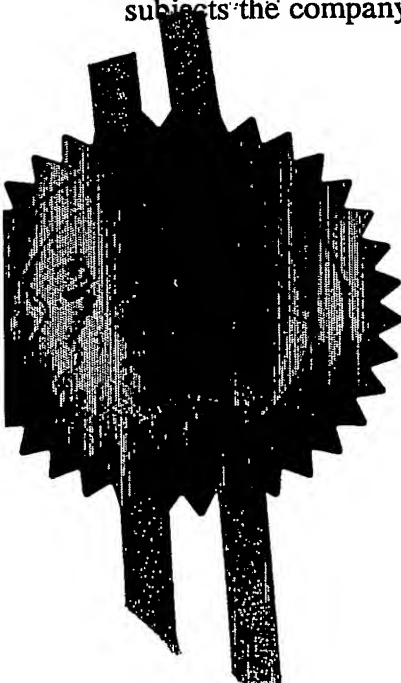
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Dated

14 June 2004



30 JAN 03 1781135-2 C4544
P01/7700 0.00-0302150.8

1/77

Request for grant of a patent

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THE PATENT OFFICE
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NEWPORT

The Patent Office

Cardiff Road
Newport
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NP10 8QQ

1. Your reference

2. Patent application number

(The Patent Office will fill in this part)

0302150.8

3. Full name, address and postcode of the or of each applicant (underline all surnames)

IN-Q-BATOR LIMITED
13 Park Road
Twickenham
Middlesex
TW1 2QD ✓
08013690002

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

England

4. Title of the invention

Glass Bottle Breaking Apparatus

5. Name of your agent (if you have one)

Richard John Albert Gordon

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

13 Park Road
Twickenham
Middlesex
TW1 2QD

Patents ADP number (if you know it)

07537004001 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

Yes

- a) any applicant named in part 3 is not an inventor, or
 - b) there is an inventor who is not named as an applicant, or
 - c) any named applicant is a corporate body.
- See note (d))

Patents Form 1/77

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Continuation sheets of this form

Description 4

Claim(s) 2

Abstract -

Drawing(s) 3

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

Request for substantive examination (*Patents Form 10/77*)

Any other documents
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

R. J. A. Gordon

Date 29/01/03

12. Name and daytime telephone number of person to contact in the United Kingdom

John Gordon 0208 892 7221

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Glass Bottle Breaking Apparatus

This invention relates to a glass bottle breaking apparatus.

Generally, a glass bottle breaking apparatus comprises a chute for guiding bottles successively to means for breaking the bottles into glass fragments. In WO 01/70408, for example, there is disclosed apparatus in which glass bottles are fed successively into a chute which directs the bottles towards a rotor. The arrangement is such that the bottles are broken into fragments on impact with the rotor as it rotates.

It is common for the bottles to be received in a hopper. However, since the bottles are randomly deposited in the hopper, they can, either singularly or in combination one with another, interrupt free flow of the bottles to the breaking means.

It is desirable, therefore, to provide a glass bottle breaking apparatus including a hopper wherein interruption of free flow of bottles is not an issue.

According to the present invention, there is provided a glass bottle breaking apparatus including a hopper having a base portion and walls, a shaft located below the base portion, a plurality of strike members located in spaced relation longitudinally of the shaft and drive means for rotating the shaft on a longitudinal axis thereof, wherein the base portion is provided with a plurality of slots each for receiving a corresponding one of the strike members as the shaft rotates whereby bottles located in the hopper are broken into fragments by the strike members as they sweep through the corresponding slots and strike the bottles engaged against an adjacent one of the walls of the hopper.

With an apparatus in accordance with the present invention, breakage of glass bottles resulting from impact by the strike members is effected within a hopper rather than outside of a hopper, as with glass bottle breaking apparatus known hitherto. Therefore, interruption of free flow of bottles is not an issue.

Following is a description, by way of example only and with reference to the accompanying drawings, of one method of carrying the invention into effect.

In the drawings:-

Figure 1 is a diagrammatic representation of a machine including an embodiment of glass bottle breaking apparatus in accordance with the present invention,

Figure 2 is a diagrammatic representation of part of the apparatus, and

Figure 3 is a plan view of the apparatus.

Referring now to the drawings, there is shown a glass bottle breaking machine 10 comprising a rectangular casing 11 having an upper opening 12 and a lower opening (not shown). The casing 11 is supported on a frame 13 which also supports inner panels 14 and 15, which provide a receptacle 16 for a hopper 17 and guides 18, 19 for guiding fragmented pieces of glass, a transverse shaft 20 located in bearings 20a and 20b, a motor 21 and a housing 22. The upper opening 12 is closed by means of a lid 23 which is hinged to the frame 13, as shown at 24.

The hopper 17 comprises a front wall 26, a rear wall 27, side walls, one of which is shown at 28, and a base portion 29. The front and rear walls 26, 27 slope downwardly and inwardly to the base portion 29 and the base portion 29 slopes downwardly and rearwardly from the front wall 26 to the rear wall 27. The hopper 17 is formed as a basket comprising spaced parallel stringers 30 and cross members (not shown). An upper portion of the front wall 26 of the hopper 17 is provided with lugs, one of which is shown at 31, whereby the hopper 17 is pivotally mounted on the frame 13, as shown at 32. A spring (not shown) provides a resilient bias urging the hopper 17 in an anti-clockwise direction of the pivot axis 32, when viewed in Figure 1. Preferably, the stringers 30 which form a lower corner of the hopper 17 are provided with a curved profile, as shown at 33.

An end portion of the shaft 20 adjacent the motor 21 has secured thereto a pulley 34 and a shaft 35 of the motor 21 has secured thereto a pulley 36. The pulleys 34 and 36 are linked by means of an endless belt 37 whereby rotation of the shaft 20 is effected by drive from the motor 21 through the shaft 35, the pulley 36, the belt 37 and the pulley 34.

The shaft 20 extends transversely below the hopper 17 and has secured thereto a plurality of discs 38 spaced one from another longitudinally of the shaft 20 at a distance corresponding to adjacent slots between the stringers 30 of the hopper 17. Alternate discs 38 preferably have pivotally connected thereto, as shown at 39, an end portion of each of a pair of elongate hammers 40, 41 each having at a tip thereof remote from the shaft 20 an area of reinforcement, as shown at 42. The pivot connections 39 of each pair of hammers 40, 41 are diametrically opposed one to another and the axes passing through the pivot connections 39 of adjacent discs 38 are offset by 180 degrees.

The housing 22 contains an electric circuit for controlling the motor 21, the control circuit also including switches (not shown).

Prior to operation of the machine 10, a container 43 is inserted in the machine through the lower opening and is located below the guides 18 and 19. The lid 23 is then opened and empty glass bottles are deposited in the hopper 17 and the lid 23 is closed. One of the switches of the electrical circuit is closed by downward movement of the hopper 17, against the bias of the spring, due to weight of bottles in the hopper 17. Another of the switches is closed by closure of the lid 23. The effect of closure of the switches is that the motor 21 operates thereby effecting rotation of the shaft 20. In consequence, the hammers 40, 41 are swung successively in an arc in a clockwise direction, when viewing Figures 1 and 2, through the slots between corresponding stringers 30 of the hopper 17 causing breakage of any bottle or glass fragments in the paths of the hammers 40, 41, the curved profile 33 at the lower corner of the hopper 17 being, in effect, an anvil and the areas of reinforcement 42 of the hammers 40, 41 being the areas of contact with the bottles.

Bottles are thus broken into fragmented pieces of glass and the fragments fall away through the slots between the stringers 30 of the hopper 17 and are guided from the glass bottle breaking apparatus and into the container 43 by the guides 18 and 19.

In contrast, if the switches are not closed, either because there are no bottles in the hopper 17 to provide sufficient weight in the hopper 17 to cause downward movement of the hopper 17 to effect switch closure, or because the lid 23 has not been closed after bottles have been loaded into the hopper 17, the motor 21 will not become operative. The latter ensures that the lid 23 is in a closed condition during operation of the motor 21 and that glass fragments are not ejected from the machine 10, other than from the guides 18 and 19.

The machine 10 may be provided with a rectangular plate 44 for supporting the container 43, the plate 44 being pivotally connected at one marginal edge thereof to the frame 13, as shown at 45, and an opposite marginal edge thereof being located on a sensor 46 adapted to generate signals in the control circuit indicative of loading on the plate 44. The arrangement would be such that the motor 21 would not be mobilized if there were to be no loading on the plate 44, i.e. if the container 43 were to be absent from the plate 44 and the motor 21 would be immobilized if the weight of glass fragments in the container 43, when located on the plate 44, exceeded a predetermined magnitude.

The sensor 46 may be included in a waste collection system, which is the subject of a co-pending patent application.

It will be appreciated that a machine incorporating glass bottle breaking apparatus in accordance with the present invention will be of lower overall height than glass bottle breaking machines known hitherto because the sweep of the glass breaking hammers 40, 41 is within the hopper 17.

Claims

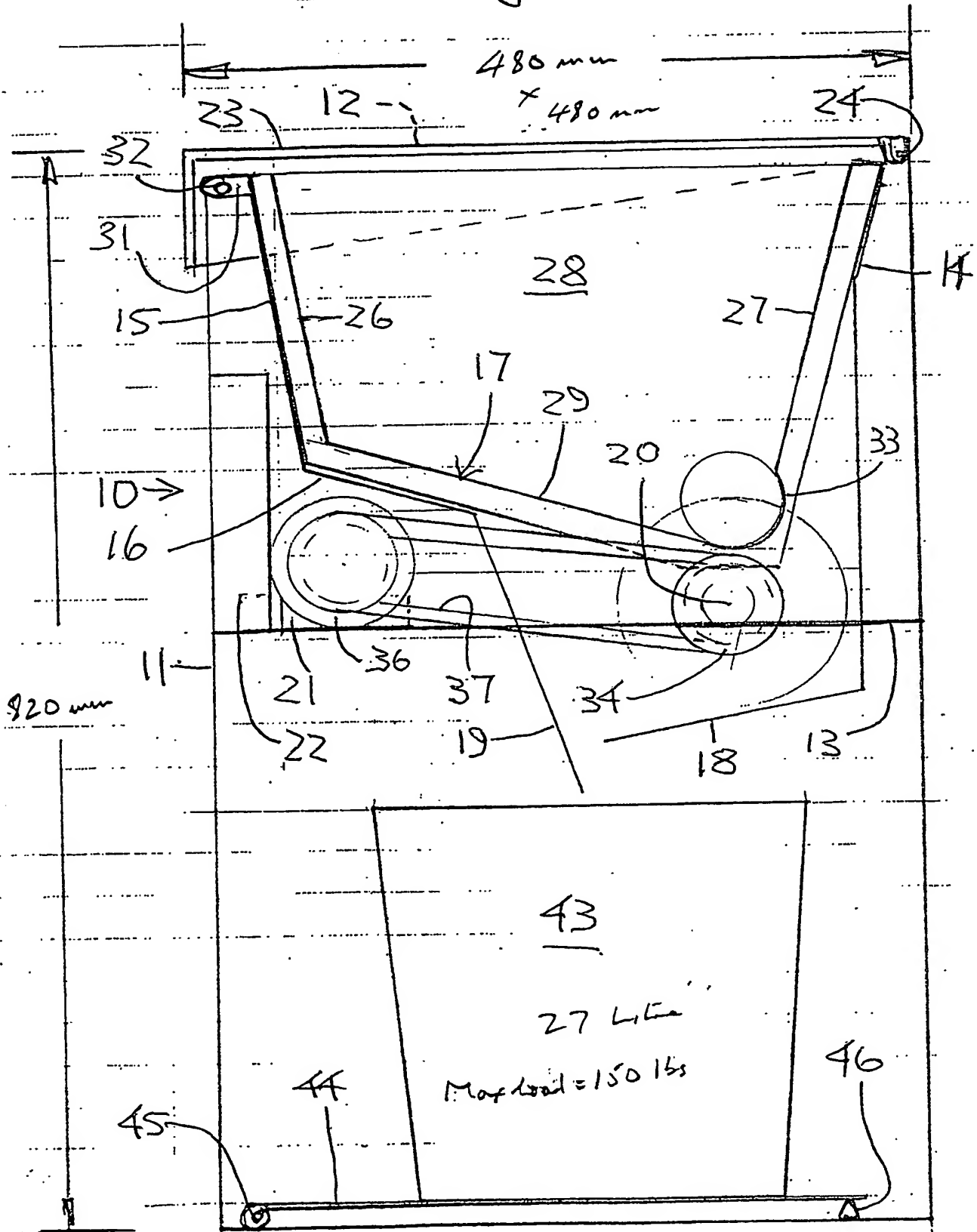
1. A glass bottle breaking apparatus including a hopper having a base portion and walls, a shaft located below the base portion, a plurality of strike members located in spaced relation longitudinally of the shaft and drive means for rotating the shaft on a longitudinal axis thereof, wherein the base portion is provided with a plurality of slots each for receiving a corresponding one of the strike members as the shaft rotates whereby bottles located in the hopper are broken into fragments by the strike members as they sweep through the corresponding slots and strike the bottles engaged against an adjacent one of the walls of the hopper.
2. Apparatus as claimed in Claim 1 wherein the strike members are pivotally connected to the shaft.
3. Apparatus as claimed in Claim 2 wherein the strike members are arranged in pairs, the pivotal connection of each pair with the shaft being at opposite ends of a diameter of the shaft.
4. Apparatus as claimed in Claim 3 wherein the diameter separating each pair of strike members is offset by 180 degrees relative to a diameter separating each adjacent pair of strike members.
5. Apparatus as claimed in any one of the preceding Claims wherein the hopper comprises a plurality of spaced stringers and a plurality of spaced cross members.
6. Apparatus as claimed in Claim 5 wherein the hopper is formed of a front wall, a rear wall and side walls, the front and rear walls sloping downwardly and inwardly to the base portion and the base portion sloping downwardly and rearwardly from the front wall to the rear wall.

7. Apparatus as claimed in Claim 6 wherein the hopper is provided with a curved profile at a junction of the rear wall and the base portion.
8. Apparatus as claimed in any one of the preceding Claims wherein the shaft is rotatively driven by a motor and there is provided control means for controlling operation of the motor.
9. Apparatus as claimed in Claim 8 wherein the control means includes means for disabling the motor unless contents are contained in the hopper.
10. Apparatus as claimed in Claim 8 or Claim 9 wherein the hopper is provided with a cover and the control means includes means for disabling the motor when the cover is not in a position covering the hopper.
11. Apparatus as claimed in any one of Claims 8 to 10 wherein the control means includes a sensor for detecting presence of a container for receiving fragments of glass which issue from the hopper.
12. Apparatus as claimed in Claim 11 wherein the control means is adapted to disable the motor when the weight of contents in the container exceeds a predetermined magnitude.
13. A glass bottle breaking apparatus substantially as hereinbefore described and as illustrated in the accompanying drawings.

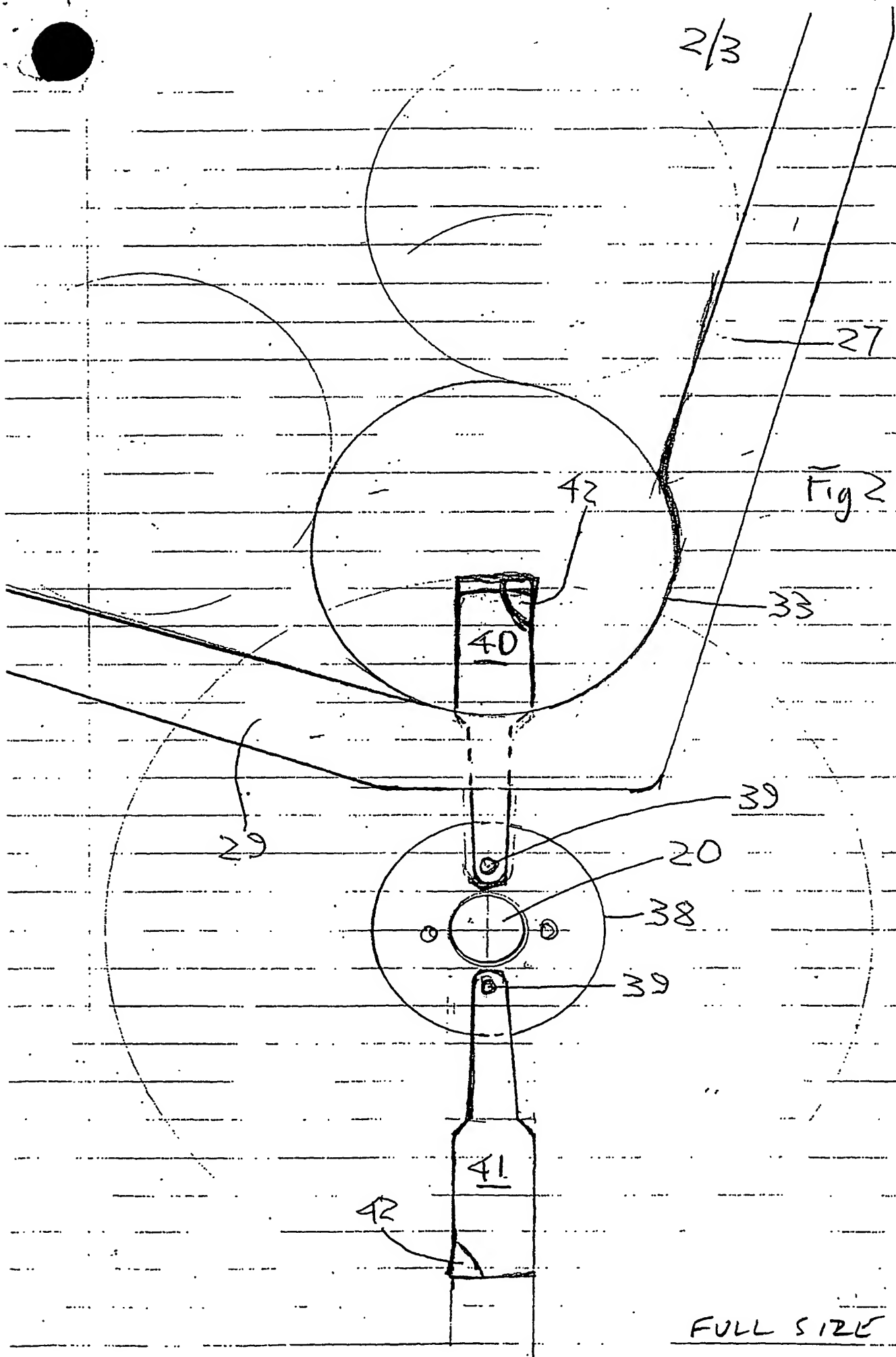
1/3

1/4 SCALE

Fig 1



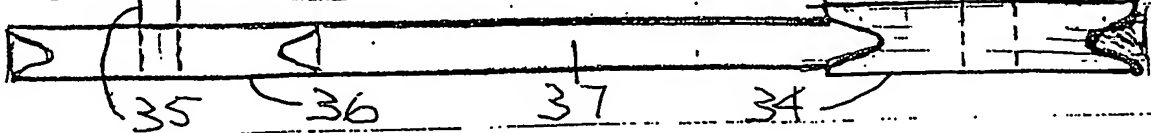
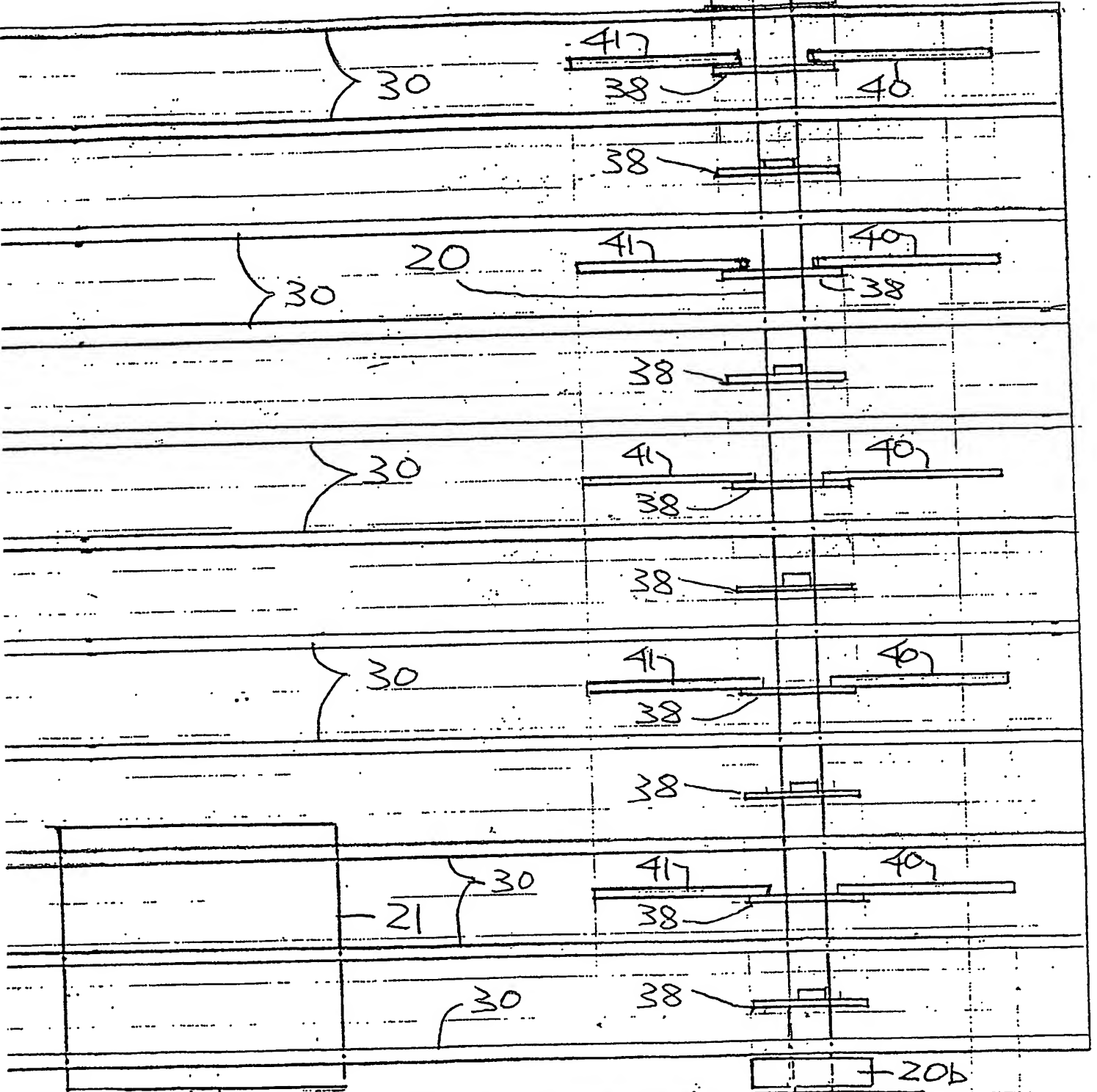
2/3



FULL SIZE

Fig 3/3

20a



1/2 SCALE